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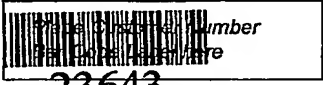
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This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53(c).

INVENTOR(S)					
Given Name (first and middle [if any])		Family Name or Surname		Residence (City and either State or Foreign Country)	
Troy D. Jon		Acton Tekulve			
<input type="checkbox"/> Additional inventors are being named on the _____ separately numbered sheets attached hereto					
TITLE OF THE INVENTION (280 characters max)					
PATIENT POSITIONING APPARATUS AND METHOD FOR ORIENTING A PATIENT IN A HOSPITAL BED					
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ENCLOSED APPLICATION PARTS (check all that apply)					
<input checked="" type="checkbox"/>	Specification	Number of Pages	19	<input type="checkbox"/>	CD(s), Number
<input checked="" type="checkbox"/>	Drawing(s)	Number of Sheets	6	<input type="checkbox"/>	Other (specify)
<input type="checkbox"/>	Application Data Sheet. See 37 CFR 1.76				
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<input checked="" type="checkbox"/>	A check or money order is enclosed to cover the filing fees.			FILING FEE AMOUNT (\$)	
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The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.					
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Respectfully submitted,

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317-231-7341

Date

6/17/2002

REGISTRATION NO.

43669

(if appropriate)

Docket Number:

7175-70200

**USE ONLY FOR FILING A PROVISIONAL APPLICATION FOR PATENT**

This collection of information is required by 37 CFR 1.51. The information is used by the public to file (and by the PTO to process) a provisional application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 8 hours to complete, including gathering, preparing, and submitting the complete provisional application to the PTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, Washington, D.C. 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Box Provisional Application, Assistant Commissioner for Patents, Washington, D.C.

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Invention:

**PATIENT POSITIONING APPARATUS AND METHOD FOR ORIENTING  
A PATIENT IN A HOSPITAL BED**


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PATENT APPLICATION  
of  
TROY D. ACTON  
and  
JON TEKULVE  
for  
PATIENT POSITIONING APPARATUS AND METHOD FOR  
ORIENTING A PATIENT IN A HOSPITAL BED

Client Reference N1-13311

Attorney Docket 7175-70200

## PATIENT POSITIONING APPARATUS AND METHOD FOR ORIENTING A PATIENT IN A HOSPITAL BED

### BACKGROUND AND SUMMARY

5 The present disclosure relates to an apparatus for orienting a person on a therapeutic device. More particularly, the present disclosure relates to an apparatus for properly orienting a patient on an adjustable hospital bed.

Some hospital beds have motors or other systems for raising, lowering, and tilting regions of a hospital bed to move a patient from a supine position to a reclined position. When a head section of the bed is raised relative to a foot section of the bed, the patient tends to be moved toward the foot section of the bed. Thus, the patient may not be in the desired therapeutic position. This necessitates moving the patient toward the head end of the bed, requiring the attention of one or more caregivers, increasing the cost of healthcare due to manpower requirements and increasing risk of injuries to caregivers from moving patients.

15 According to this disclosure, a patient positioning apparatus is disclosed for use with an adjustable hospital bed having a sheet thereon. The apparatus includes a sheet connector configured to be coupled to the sheet and the bed. The apparatus also includes a main assembly coupled to the sheet connector and the bed and coupled between the sheet connector and the bed to move the sheet toward the head end of the bed as the bed is raised.

Also according to this disclosure, an orientation apparatus is disclosed for use with a hospital bed movable between a lowered position and a raised position, the bed having a mattress movable between a supine orientation and a reclined orientation. The bed includes a bed sheet on the mattress, and the apparatus includes a sheet coupler secured to the bed with a first belt. The sheet coupler is configured to couple to the sheet and includes a main assembly and a sheet connection bar. A portion of the sheet is wrapped around the sheet connection bar so that the sheet is releasably secured to the sheet coupler between the sheet connection bar and the main assembly, and the sheet remains with the main assembly when the bed is moved from the lowered position toward the raised position.

Further according to this disclosure, a patient support device includes a frame, a patient support deck supported by the frame, the support deck being movable between a lowered position and a raised position, and a supine orientation and a reclined orientation. A mattress is situated on the support deck, and a sheet is situated on the mattress. The support device also includes a patient positioning apparatus coupled to the frame. The apparatus includes a sheet coupler releasably coupled to the sheet to move a patient to a proper therapeutic orientation as the patient support deck is moved from the lowered position toward the raised position.

In an illustrative embodiment of one or more of these aspects of the disclosure, a tensioning mechanism is included to maintain taut a belt extending between the bed and the apparatus. In an exemplary implementation of this embodiment the tensioning mechanism includes a ratchet to permit winding of the belt but inhibit unwinding of the belt.

In another illustrative embodiment of one or more of these aspects of the disclosure, the sheet or liner is wrapped around a portion of the sheet coupler and remains in position relative to the coupler when the bed is moved between the supine and reclined orientations.

In another illustrative embodiment of one or more of these aspects of the disclosure, a belt extending between the bed and the apparatus extends over a headboard of the bed. In an exemplary implementation of this embodiment, the headboard includes a pair of spaced apart walls that form a notch to retain the belt between the walls as the bed is moved between the supine and reclined orientations.

In another illustrative embodiment of one or more of these aspects of the disclosure, the sheet coupler is formed to include a space in which an upper edge of a headboard of the bed fits to assist in retention of the sheet coupler in a stored orientation.

Additional features will become apparent to those skilled in the art upon consideration of the following detailed description of illustrative embodiments exemplifying the best mode of carrying out the various inventions disclosed herein as presently perceived.

**BRIEF DESCRIPTION OF THE DRAWINGS**

The detailed description particularly refers to the accompanying figures in which:

5 Fig. 1 is a side elevational view of a hospital bed and a patient positioning apparatus for coupling to a sheet to move a patient to a desired therapeutic orientation, the apparatus shown mounted in a stored position on a headboard of the bed, and the bed shown in a supine or flat orientation (in solid) and a reclined orientation (in phantom);

10 Fig. 2 is a fragmentary exploded perspective view of the apparatus of Fig. 1, showing a main assembly coupled to the bed by a first belt, a portion of its housing removed to expose a tensioning mechanism, and a sheet coupler with a connection bar coupled thereto by a second belt;

15 Fig. 3 is a perspective view of the sheet coupler showing a caregiver rolling up a head end of the sheet in the sheet connection bar and the main assembly positioned to couple to the sheet connection bar;

Fig. 4 is an exploded perspective view of the tensioning mechanism;

20 Fig. 5 is a sectional side view of the sheet coupler taken generally along section line 5-5 of Fig. 2 showing a pawl moved to an actuated position engaging a toothed wheel in a locked orientation to inhibit lengthening of the first belt, and the connection bar coupled to a retainer on the main assembly;

25 Fig. 6 is a sectional side view similar to Fig. 5, showing a handle moved to a position releasing the pawl from the locked orientation of Fig. 5 to a released position disengaged from the toothed wheel, and the tensioning mechanism rotating to remove slack in the first belt, moving the main assembly toward a head board of the bed;

Figs. 7-10 show a sequence in which the patient positioning apparatus is in the stored position and the bed is moved between the supine or flat orientation and the reclined orientation.

30 Fig. 7 is a side elevation of the bed in the supine orientation showing the patient in a desired therapeutic orientation corresponding with his feet being spaced from a foot end of the bed by a distance A;

Fig. 8 is a side elevation of the bed now moved to the reclined orientation showing the patient moved from the desired therapeutic orientation, toward the foot end of the bed, with his feet being spaced from the foot end of the bed now by a distance B, shorter than A;

5 Fig. 9 is a side elevation of the bed moved again to the supine orientation, showing the patient's feet spaced from the foot end of the bed by a distance B;

10 Fig. 10 is a side elevation of the bed moved again to the reclined orientation, showing the patient moved still farther from the desired therapeutic orientation, with his feet overhanging the foot end of the bed by a distance C;

Figs. 11-13 show a sequence in which the patient positioning apparatus is coupled to a bed sheet, and the bed is moved between the lowered position and the raised position.

15 Fig. 11 is a side elevation of the bed in the lowered position and supine orientation showing the patient in the desired therapeutic orientation corresponding with his feet being spaced from the foot end of the bed by the distance B;

20 Fig. 12 is a side elevation of the bed now moved to the raised position, showing the patient positioning apparatus pulling the sheet and the patient to the desired therapeutic orientation with his feet spaced from the foot end by the distance A; and

Fig. 13 is a side elevation of the bed returned to the lowered position, showing the patient in the desired therapeutic orientation, with his feet spaced from the foot end by the distance A.

## 25 DETAILED DESCRIPTION

Referring now to Fig. 1, a hospital bed 20 includes a patient support deck 22 coupled to a lower frame portion 24 for supporting support deck 22 above the floor. Bed 20 includes a mattress 26 supported by patient support deck 22. Bed 20 includes a drive mechanism 28 to adjust regions of bed 20 to move mattress 26 among  
30 multiple positions. Such positions include a generally supine or flat position, such as shown in Figs. 7 and 9, a reclined position, such as shown in Figs. 8 and 10, a raised position as shown in Fig. 12, and a lowered position shown in Fig. 11. One example



of such a drive mechanism is disclosed in U.S. Patent 5,715,548, the disclosure of which is hereby expressly incorporated by reference.

As illustrated in Fig. 3, a patient positioning apparatus 30 is coupled to bed 20 and to a sheet 32 to grip and pull sheet 32 toward a head end 56 of bed 20 as bed 20 is moved to the raised position. To move a patient 34 back to the desired therapeutic position, a caregiver couples apparatus 30 to sheet 32, actuates apparatus 30 to prevent lengthening of the apparatus, and moves bed 20 toward a raised position. Because apparatus 30 is secured to a portion of bed 20 that does not move with mattress 26, apparatus 30 pulls sheet 32 relative to mattress 26 as bed 20 is raised. This returns patient 34 to the desired therapeutic position, as shown in Fig. 13.

When apparatus 30 is in its stored orientation, as illustrated in Figs. 1 and 7-10, and bed 20 is moved from a supine position (Fig. 7) to a reclined position (Fig. 8), patient 34 on sheet 32 is moved or scooted toward foot end 36 of bed 20. In Fig. 7, patient 34 is shown in a desired therapeutic position, corresponding with the patient's feet being a distance A from foot end 36 of bed 20. As shown in Fig. 8, bed 20 has been moved from the position of Fig. 7 in direction 38 to the reclined position, forcing patient 34 toward foot end 36 of bed 20 so that the patient's feet are a distance B from foot end 36. Thus, patient 34 has been moved a distance equal to the difference between distances A and B. As bed 20 is returned to the supine position and moved again to the reclined position, as shown in Figs. 9 and 10 respectively, patient 34 is moved farther toward foot end 36 of bed 20 so that the patient's feet are a distance C from foot end 36. Thus, patient 34 has been moved an overall distance equal to the difference between distances A and C.

To correct the position of patient 34, apparatus 30 is coupled to sheet 32 and is actuated (as explained more fully below), and bed 20 is moved from the lowered position shown in Fig. 11 to the raised position shown in Fig. 12. As bed 20 is moved in direction 39 to the raised position, apparatus 30 grips sheet 32 and, since it is secured to the bed frame, pulls sheet 32 toward the head end 56 of mattress 26. Thus, as bed 20 is moved in direction 39 to the raised position, patient 34 is pulled along with sheet 32 to the desired therapeutic position shown in Figs. 1 and 13, with his feet again at a distance A from foot end 36.

Patient positioning apparatus 30 is coupled to bed 20, illustratively to a frame member 42 of bed 20 that does not move proportionally to mattress 26 as bed 20 is moved among the reclined, supine, raised, and lowered positions. Apparatus 30 includes a sheet coupler 44 to selectively couple apparatus 30 to sheet 32. Apparatus 30 includes a first belt 46 to secure the sheet coupler 44 to bed 20. Sheet coupler 44 is coupled to or grips sheet 32. As shown in Fig. 2, first belt 46 is coupled at a first belt end 48 to bed frame member 42 and at a second belt end 50 to sheet coupler 44. First belt 46 is under tension from sheet coupler 44 to remove unnecessary slack from first belt 46 by winding belt 46 as described more fully below.

Sheet coupler 44 includes a main assembly 52 and a sheet connection bar 54 around which a caregiver wraps part of a head end 56 of sheet 32. Sheet connection bar 54 is coupled to the main assembly 52 with a tether or second belt 58. As shown in Fig. 3, to connect sheet 32 with sheet coupler 44, sheet connection bar 54 is placed adjacent head end 56 of sheet 32. Bar 54 is rotated in direction 59 about a longitudinal axis 60 through bar 54, rolling bar 54 toward a foot end 62 of sheet 32 so that a portion of head end 56 of sheet 32 is wrapped around bar 54. With this portion of sheet 32 wrapped as such, bar 54 is coupled to retainer 64, as shown in Figs. 5 and 6, which inhibits movement of bar 54 and thus sheet 32.

A first end 70 of second belt 58 is secured to sheet connection bar 54, and a second end 72 of belt 58 is secured to main assembly 52, illustratively with a screw 73. Second belt 58 has a length that enables a caregiver to maneuver bar 54, illustratively to permit several turns of bar 54 about axis 60, to wrap sheet 32 thereabout.

As shown in Figs. 2, 3, 5 and 6, retainer 64 is, illustratively, a pair of spaced apart hooks 66, 68 in which bar 54 is inserted to retain sheet 32. Sheet 32 is retained by pinching the head end 56 of sheet 32 between the hooks 66, 68 and outer regions 55 of bar 54, inhibiting sheet 32 from unwinding from bar 54. Illustratively, a central portion 57 of bar 54 has a surface that is relatively abrasive so that it grips sheet 32 to inhibit removal of sheet 32. Central portion 55 may have applied thereon a foam, a grit, a tackifier, or other material or combination of materials to increase the friction between central portion 55 and sheet 32. As shown in Fig. 2, sheet connection bar 54 has a width W - illustratively between about 6 and 18 inches.

However, sheet connection bar 54 can have a wide variety of widths to permit a sufficient region of sheet 32 to be wrapped in bar 54 to couple sheet 32 to sheet coupler 44.

As shown in Figs. 2, 4-6, main assembly 52 includes a tensioning mechanism 74 to take up slack in first belt 46. Tensioning mechanism maintains the tension on belt 46 by winding up the excess length of belt 46 between bed 20 and main assembly 52. Tensioning mechanism 74 includes a ratchet 76 to selectively permit movement of sheet coupler 44 relative to first belt 46 in a belt shortening direction 78 and a belt-lengthening direction 80. Illustratively, a caregiver actuates a pawl 82 to move the ratchet to a latched or actuated position so that sheet coupler 44 is inhibited from moving relative to first belt 46 in a belt-lengthening direction 80, but uncoiling of first belt 46 in belt-lengthening direction 80 is permitted.

Main assembly 52 includes a housing 84 having a recess 86 to house the tensioning mechanism 74 and the portion of first belt 46 that is coiled up by tensioning mechanism 74. Main assembly 52 includes retainer 64, illustratively spaced apart hooks 66, 68 coupled to sides of housing 84. As shown in Figs. 5 and 6, hooks receive sheet connection bar 54, holding a portion of sheet 32 between hooks 66, 68 and bar 54. Housing 84 includes a pair of handles 88, 90 illustratively bordering an opening 92 through housing 84 on each side of recess 86. To manually move sheet 32, without using drive mechanism 28, when sheet coupler 44 is coupled to sheet 32 one or more caregivers inserts a hand into an opening 92 and pulls on one of handles 88, 90 of main assembly 52, and moves the patient to a desired position.

Tensioning mechanism 74 maintains tension on first belt 46 by automatically winding or coiling belt 46, removing slack in the portion of belt 46 between sheet coupler 44 and bed 20. First belt 46 is uncoiled by pulling sheet coupler 44 toward foot end 36. The tensioning action of tensioning mechanism 74 can be suspended by actuating a handle 94 to inhibit winding of belt 46 to permit a caregiver to have enough slack in first belt 46 to couple sheet coupler 44 to sheet 32.

Tensioning mechanism 74 includes a bracket 110 coupled to housing 84. Bracket 110 supports a spool 112 about which first belt 46 is coiled or wound. A biasing member 114, illustratively a torsion spring, is coupled to spool 112 and housing 84 to bias spool 112 in direction 114 about an axis 116 extending

longitudinally through spool 112, as shown in Figs. 5 and 6. Thus, first belt 46 is biased in belt-shortening direction 78.

As shown in Figs. 4-6, tensioning mechanism 74 further includes ratchet 76 to selectively restrict movement of spool 112. Ratchet 76 includes a wheel 122 having teeth 124 projecting radially outwardly around the circumference of wheel 122. Each of teeth 124 includes a straight surface 126 that lies generally in a plane extending radially from center 128 of wheel 122. Each of teeth 124 includes a sloped surface 130 forming an acute angle 132 with straight surface 126. Wheel 122 includes an opening 134 at its center 128 to receive a first end 136 of spool 112 therein. Opening 134 is complementary in shape to first end 136, illustratively rectangular when viewed along axis 116. When handle 94 is moved to the latched or actuated position shown in Fig. 5, ratchet 76 illustratively permits rotation of spool 112 in direction 114 but inhibits movement in the opposite direction.

As illustrated in Fig. 4, spool 112 is rotatably supported by bracket 110. Bracket 110 is coupled to a support mount 138 that has an L-shape when viewed in cross section, as illustrated in Figs. 5 and 6. Support mount 138 has a first region 140 to which retainer 64 and second belt 58 are coupled. Support mount 138 also has a second region 141 to which bracket 110 is coupled, as shown in Fig. 4.

As shown in Fig. 4, bracket 110 includes a base 142, illustratively a substantially flat plate, formed to include holes (not shown) therein to receive retainers 144 therethrough to couple bracket 110 to mount 138. A pair of spaced flanges 146, 148 extends from base 142, each flange 146, 148 formed to include a spool aperture 150 therein. Spool aperture 150 is defined by a bearing surface 152 sized and shaped complementarily to the journals 154 on spool 112. Spool 112 is inserted into spool aperture 150 so that journals 154 are aligned with bearing surfaces 152.

A central portion 156 of spool 112 is situated between flanges 146, 148, and first end 136 projects outside one of flanges 146, 148, positioned to be received in opening 134 of wheel 122. Wheel 122 is thus mounted on end 136 of spool 112, and secured thereto by retainer 158, illustratively a screw received in a screw aperture 159 formed in first end 136 of spool 112. Retainer 158 has a head 160 larger than a width X of opening 134 to sandwich wheel 122 between one of flanges

146, 148 and retainer head 160. Thus, wheel 122 is coupled to spool 112 and configured to move therewith.

A second end 162 of spool 112 extends beyond the other of flanges 146, 148. A spring-receiving slot 164 is formed in second end 162 and receives a first portion 166 of biasing member 114. A second portion 168 of biasing member 114 is coupled to mount 138, illustratively inserted in a notch 170 formed in second region 141 of support mount 138. A belt-receiving slot 172 is formed in central portion 156 of spool 112 to receive distal end 174 of first belt 46.

As shown in Fig. 5, to limit unwinding of first belt 46, an engagement surface 176 of pawl 82 engages straight surface 126 of one of teeth 124. Pawl 82 is coupled to a main body 178 including spaced apart walls 180, 182 that lie adjacent portions of flanges 146, 148. Holes 184 through each wall 180, 182 and flanges 146, 148 are aligned and receive a pin 186 therethrough to pivotally mount main body 178 to bracket 110. A central bar 188 extends between and couples to each of walls 180, 182 of main body 178. As shown in Figs. 5 and 6, a projection 190 extends from central bar 188, through an opening 192 formed in housing 84. Actuator or handle 94 is coupled to projection 190 to permit a caregiver to actuate ratchet 76 and move pawl 82.

As shown in Fig. 6, when a caregiver actuates ratchet 76 by moving handle 94 in direction 194, pawl 82 moves in direction 195 about an axis 196 through pin 186 to the position illustrated in Fig. 5, so that engagement surface 176 engages straight surface 126. In this orientation, movement of sheet coupler 44 relative to first belt 46 is inhibited in belt-lengthening direction 78 so that the caregiver can move bed 20 to the raised position shown in Fig. 12. Handle 94 is illustratively biased by pawl biasing member 198, illustratively a coil spring, to a position so that pawl 82 disengages wheel 122 and engagement surface 176 normally disengages straight surface 126. It is within the scope of this disclosure, however, for handle 94 and pawl 82 to be biased so pawl 82 normally engages wheel 122. It is also within the scope of this disclosure to eliminate pawl biasing member 198 so that handle 94 and pawl 82 are not biased in either direction. It is also within the scope of this disclosure for teeth 124 to be shaped and pawl 82 to be shaped and/or positioned relative to teeth 124 so

that first belt 46 is not automatically wound about spool 112, but pawl 82 must first be disengaged to wind belt 46 about spool 112.

As shown in Fig. 6, a caregiver releases or moves handle 94 so that pawl 82 is in the released position shown in Fig. 6 when first belt 46 needs to be lengthened, such as when the caregiver is disconnecting sheet coupler 44 from sheet 32 or when the caregiver removes main assembly 52 from the stowed position to couple sheet coupler 44 to sheet 32. When handle 94 is moved in direction 197 to the actuated or latched position shown in Fig. 5, pawl 82 moves in direction 199 about axis 196, and pawl 82 engages teeth 124 to inhibit rotation of spool 112.

Illustratively, tensioning mechanism 74 automatically removes slack from first belt 46 when first belt 46 is not taut. Pawl 82 moves to permit spool 112 to rotate in belt-shortening direction 78. As wheel 122 rotates about axis 116 in response to the bias of biasing member 114, sloped surface 130 cams against a cam surface 178 of pawl 82, moving pawl 82 against the bias of pawl biasing member 198 to disengage engagement surface 176 from straight surface 126. Thus, slack is automatically removed from first belt 46. It is within the scope of this disclosure to eliminate the automatic tensioning of ratchet 76, for example, by eliminating the sloped surface 130 so that pawl 82 engages one or more of teeth 124 to inhibit motion of spool 112 in both directions about axis 116.

Main assembly 52 includes a belt guide 220 to guide first belt 46 from opening 222 in housing through which belt 46 moves at it is wound and unwound from spool 112. Belt guide 220 is illustratively a plate having a substantially flat central portion 224 including a slot 226 formed therein. Slot 226 has a width slightly larger than the width of first belt 46. A wall 228 extends from each edge of central portion 224 generally parallel to the length of slot 226. An ear 230 extends upwardly from each flange 146, 148 and fits in recess 232 formed by the junction of walls 228 and central portion 224. When housing 84 is assembled, belt guide 220 is held in place between housing 84 and ears 230. First belt 46, residing in slot 226, also inhibits movement of belt guide 220.

In the stored position of apparatus 30, sheet coupler 44 is coupled to a headboard 239 of bed 20. Hooks 66, 68 are illustratively J-shaped, having a relatively longer leg 240, a relatively shorter leg 242, and a lower section or bight 244 joining

the two legs. Ends 246 of longer legs 240 are coupled to main assembly 52, illustratively to support mount 138. Ends 246 are situated between a first part 248 of housing 84 and support mount 138. Illustratively, housing 84 includes a second part 250 that couples to first part 248 to house some of the components described above.

5           Housing 84 assists in retention of apparatus 30 in the stored position. Second part 250 of housing 84 includes a lip 252 extending downwardly from an interior surface 254 of housing 84. Lip 252 extends generally parallel to longer leg 240 of each hook 66, 68, forming a space 255 between lip 252 and retainer 64. To store apparatus 30, lip 252 and retainer 64 are placed over an upper edge 256 of headboard 239. Upper edge 256 is thus situated in the space 255 between hooks 66, 68 and lip 252 so that sheet coupler 44 is releasably stored on headboard 239. It is within the scope of this disclosure for lip 252 to extend the length from a location adjacent one hook 66, 68 to a location adjacent the other hook, for lip 252 to be one or more smaller portions that cooperate with one or both of hooks 66, 68 to form a space 15 between which upper edge 256 is situated when sheet coupler 44 is stored.

As shown in Fig. 2, first belt 46 is secured to bed 20 by coupling a first belt end 48 of first belt 46 to bed frame member 42. Bed frame member 42 is illustrated in Figs. 1 and 7-13 as part of the support structure of bed 20, however it is within the scope of this disclosure for frame member 42 to be the headboard 239, some other portion of bed 20, or another object that does not move with mattress 26 as bed 20 is moved among the raised, lowered, supine, and reclined positions. First belt 46 can be coupled to bed 20 in a variety of ways. As illustrated in Fig. 2, belt 46 is coupled to a bracket 260 - first end 48 of belt 46 is fed through a slot 262 formed in bracket 260 and coupled to itself. A fastener 264, illustratively a screw, couples 20 bracket 260 to frame member 42, illustratively extending through a hole 266 formed in bracket 260. 25

When sheet coupler 44 is coupled to sheet 32, as illustrated in Figs. 11-13, first belt 46 stretches from tensioning mechanism 74, over the upper edge 256 of headboard 239, to its point of coupling with bed 20. First belt is situated in a retention groove or notch 268 formed in upper edge 256. Walls 270 of notch 268 limit lateral movement of belt 46 as sheet coupler 44 is moved. 30

Although first and second belts 46, 58 are illustratively webs, it is within the scope of this disclosure that, where first and/or second belts 46, 58 are provided, a variety of flexible connecting members, such as one or more of cords, lines, cables, chains, ties, straps, bands, or the like, may be used. Additionally,  
5 alternative arrangements of bed 20 are within the scope of this disclosure.

Although various apparatus and systems have been described in detail with reference to certain preferred or illustrative embodiments, variations and modifications of each of these apparatus and systems exist within the scope and spirit of the invention as described and defined in the following claims.

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## CLAIMS

1 A1. A patient positioning apparatus for use with an adjustable  
hospital bed having a mattress with a sheet thereon, the bed being movable between a  
5 raised position and a lowered position, the apparatus comprising:

a sheet connector configured to be coupled to the sheet and the bed,  
a main assembly coupled to the sheet connector and the bed and  
coupled between the sheet connector and the bed to move the sheet relative to the  
mattress when the bed is moved from the lowered position toward the raised position.

10 A1.1. The apparatus of claim A1, further comprising a belt extending  
between the main assembly and the bed, wherein the main assembly includes a  
tensioning mechanism including a spool biased by a biasing mechanism to wrap the  
belt around the spool and to maintain the belt taut.

15 A2. The apparatus of claim A1, wherein the sheet connector is a bar  
around which a portion of the sheet is wrapped.

A3. The apparatus of claim A2, wherein the main assembly  
includes a retainer configured to pinch the sheet between the bar and the retainer  
when the bar is coupled to the retainer.

20 A3.5 The apparatus of claim A3, wherein the retainer is a pair of  
spaced apart hooks, the bar has a rectangular cross-sectional shape, and the hooks  
have a shape complementary to the cross-sectional shape of the bar to inhibit  
unwinding of the sheet from the bar when the bar is coupled to the retainer.

A4. The apparatus of claim A2, wherein the bar is coupled to the  
main assembly with a tether having a length sufficient to permit a caregiver to wrap a  
25 portion of the sheet around the bar.

A4.5 The apparatus of claim A2, wherein the bar includes an  
abrasive central portion to inhibit unwinding of the sheet from the bar.

30 A5. The apparatus of claim A1.1, wherein the tensioning  
mechanism includes a ratchet including a pawl and a toothed wheel coupled to the  
spool, the pawl engaging the toothed wheel to inhibit movement of the spool in a  
second direction opposite the first direction.

A7. The apparatus of claim A5, wherein the pawl is movable between a first position engaging the wheel to a second position disengaged from the wheel, around which a portion of the belt is wound, and the biasing member biases the spool in a first direction to wind the belt about the spool.

5 B1. An orientation apparatus for use with a hospital bed movable among a raised position and a lowered position, the bed having a mattress movable between a supine orientation and a reclined orientation and a bed sheet on the mattress, the apparatus comprising:

20 a sheet coupler secured to the bed with a first belt and configured to couple to the sheet, the sheet coupler including a main assembly and a sheet connection bar around which a portion of the sheet is wrapped, the sheet releasably secured to the sheet coupler between the sheet connection bar and the main assembly so that the sheet remains with the main assembly when the bed is moved between the lowered position and the raised position.

15 B1.5. The apparatus of claim B1, wherein the main assembly includes a pair of spaced apart hooks to receive the sheet connection bar and pinch the sheet between the hooks and the main assembly to inhibit unwrapping of the sheet from the sheet connection bar.

20 B2. The apparatus of claim B1, wherein the bed includes a headboard and the first belt is coupled to the bed adjacent the headboard, the first belt routed over the headboard so that when the sheet coupler is secured to the sheet, the first belt engages an upper edge of the headboard when the bed is in the raised position.

25 B3. The apparatus of claim B1, wherein the first belt has a length extending between the sheet coupler and the bed, and the sheet coupler includes a **tensioning** mechanism to remove excess length in the first belt between the bed and the sheet coupler.

30 B4. The apparatus of claim B3, wherein the tensioning mechanism includes a spool around which a portion of the belt is wound, and the biasing member biases the spool in a first direction to wind the belt about the spool.

B5. The apparatus of claim B4, wherein the tensioning mechanism includes a ratchet including a pawl and a toothed wheel coupled to the spool, the pawl

engaging the toothed wheel to inhibit movement of the spool in a second direction opposite the first direction when the pawl is actuated.

5 B6. The apparatus of claim B5, wherein the pawl is movable from a first position disengaging the wheel to a second position engaging the wheel, around which a portion of the belt is wound, and the biasing member biases the spool in a first direction to wind the belt about the spool.

B7. The apparatus of claim B1, wherein the sheet connection bar is connected to the main assembly with a second belt having a length to permit a caregiver to wrap the portion of the sheet about the connection bar.

10 B8. The apparatus of claim B1, wherein the sheet connection bar includes a central portion having a relatively abrasive surface.

B9. The apparatus of claim B1, wherein the sheet coupler includes a downwardly extending lip cooperating with the retainer to form a space therebetween, the space receiving an upper edge of the headboard to store the  
15 apparatus in a stored position when the apparatus is disconnected from the sheet.

B10. The apparatus of claim B1, wherein the main assembly includes a pair of spaced apart handles bordering apertures configured to permit a caregiver to grasp the handles.

20 D1. A patient support device comprising:  
a frame,  
a patient support deck supported by the frame, the support deck being movable among a raised position, a lowered position, a supine position, and a reclined position,

25 a mattress situated on the support deck,  
a sheet situated on the mattress, and  
a patient positioning apparatus coupled to the frame, the apparatus comprising a sheet coupler releasably coupled to the sheet to move a patient to a desired therapeutic position as the patient support deck is moved to the raised position.

30 D2. The support device of claim D1, wherein the patient positioning apparatus further comprises a belt coupled to and extending between the sheet coupler

and the bed, and the bed includes a headboard over which the belt stretches when the sheet coupler is coupled to the sheet.

D3. The support device of claim D2, wherein the headboard is formed to include a notch bordered by a pair of spaced apart walls to retain the belt therebetween when the sheet coupler is coupled to the sheet.

D4. The support device of claim D2, wherein the apparatus is formed to include a space and the headboard includes an upper edge sized to fit in the space to hold the sheet coupler in a stored orientation uncoupled from the sheet.

D5. The support device of claim D1, wherein the sheet coupler includes a retainer and a sheet connector bar around which a portion of a head end of the sheet is wrapped, the sheet connector bar being removably coupled to the retainer to inhibit movement of the bar and the sheet.

D5.5. The support device of claim D5, wherein the sheet coupler includes a main assembly and the connector bar is coupled to the main assembly with a tether having a length to permit a caregiver to wrap the portion of the head end of the sheet around the sheet connector bar.

D6. The support device of claim D5, wherein the sheet is pinched between the sheet connector bar and the retainer when the sheet coupler is coupled to the sheet.

D7. The support device of claim D5, wherein the sheet connector bar includes an abrasive central region to engage the sheet and inhibit unwrapping of the sheet from the sheet connector bar.

D8. The support device of claim D6, wherein the patient positioning apparatus includes a belt with a length extending between the sheet coupler and the bed, and the sheet coupler includes a tensioning mechanism to remove excess length in the belt between the bed and the sheet coupler.

D9. The apparatus of claim D8, wherein the tensioning mechanism includes a spool around which a portion of the belt is wound, and the biasing member biases the spool in a first direction to wind the belt about the spool.

D10 The apparatus of claim D9, wherein the tensioning mechanism includes a ratchet including a pawl and a toothed wheel coupled to the spool, the pawl engaging the toothed wheel to inhibit movement of the spool in a second direction

opposite the first direction, and disengaging the toothed wheel to permit movement of the spool in the first direction.

D11. The apparatus of claim D8, wherein the tensioning mechanism includes a biasing member coupled to a spool and biased to rotate the spool to wind the belt around the spool to maintain the belt taut between the bed and the sheet coupler, the tensioning mechanism including a pawl to engage a toothed wheel to inhibit unwinding of the belt from the spool, the pawl being biased to a position disengaged from the wheel to permit a caregiver to increase the length of belt between the sheet coupler and the bed.

D12. The apparatus of claim D8, wherein the tensioning mechanism includes a biasing member coupled to a spool and biased to rotate the spool to wind the belt around the spool to maintain the belt taut between the bed and the sheet coupler, the tensioning mechanism including a pawl movable between a position engaging a toothed wheel to inhibit unwinding of the belt from the spool and a position disengaged from the wheel to permit unwinding of the belt from the spool.

E1. A patient positioning apparatus for orienting a patient in a desired position in a bed on a liner, the apparatus comprising:

a sheet coupler including means for coupling the liner to the apparatus so that, as the bed is moved from a lowered orientation to a raised orientation, the liner moves toward a head end of the bed and with the sheet coupler.

E2. The apparatus of claim E1, wherein the sheet coupler includes a main assembly and a sheet connection bar, the means for coupling the liner to the apparatus includes a retainer coupled to the main assembly, and the sheet connection bar and the retainer pinch the liner between the retainer and the sheet connection bar to grip the liner.

E2.5 The apparatus of claim E2, wherein the sheet connection bar is wrapped in a head end of the liner, and the retainer has a shape complementary to the shape of the sheet connection bar

E3. The apparatus of claim E2, wherein the sheet connection bar includes an abrasive central region, and the means for coupling the liner to the apparatus includes the central region.

E4. The apparatus of claim E1, further comprising a belt coupled to the bed and to the sheet coupler.

E5. The apparatus of claim E4, wherein the sheet coupler includes a tensioning mechanism to maintain the belt taut between the bed and the sheet coupler.

5 E6. The apparatus of claim E5, wherein the tensioning mechanism includes a spool biased to maintain tension on the belt to wind the belt about the spool.

E7. The apparatus of claim E1, further comprising a tensioning mechanism and wherein the sheet coupler is coupled to the bed with a belt extending  
10 between and coupled to the bed and the tensioning mechanism, the tensioning mechanism winding the belt to maintain the belt taut between the sheet coupler and the bed.

E8. The apparatus of claim E7, wherein the tensioning mechanism includes a spool rotatably coupled to the sheet coupler and biased to wind the belt  
15 thereabout.

F1. A patient positioning apparatus for moving a bed sheet toward a head end of a hospital bed mattress, the apparatus comprising:

a sheet coupler for coupling to the sheet,  
a first belt coupled to the bed adjacent a first belt end, and coupled  
20 adjacent a second belt end to the sheet coupler,

the sheet coupler including a main assembly and a sheet connection member coupled by a second belt to the main assembly to permit a user to wrap a portion of the bed sheet around the sheet connection member, the sheet coupler including a tensioning mechanism to maintain the length of the first belt taut between  
25 the sheet coupler and the bed.

F2. The apparatus of claim F1, wherein the bed includes a headboard over which the first belt stretches when the sheet coupler is coupled to the sheet.

F3. The apparatus of claim F2, wherein the headboard is formed to  
30 include a notch bordered by a pair of spaced apart walls to retain the belt therebetween when the sheet coupler is coupled to the sheet.

F4. The apparatus of claim F2, wherein the sheet coupler is formed to include a space and the headboard includes an upper edge sized to fit in the space to hold the sheet coupler in a stored orientation uncoupled from the sheet.

5 F5. The apparatus of claim F1, wherein the sheet coupler includes a retainer and the sheet connector member is removably coupled to the retainer to inhibit movement of the sheet connection member and the sheet.

F6. The apparatus of claim F5, wherein the sheet is pinched between the sheet connection member and the retainer when the sheet coupler is coupled to the sheet.

10 F7. The apparatus of claim F1, wherein the sheet connection member includes an abrasive central region to engage the sheet and inhibit unwrapping of the sheet from the sheet connection member.

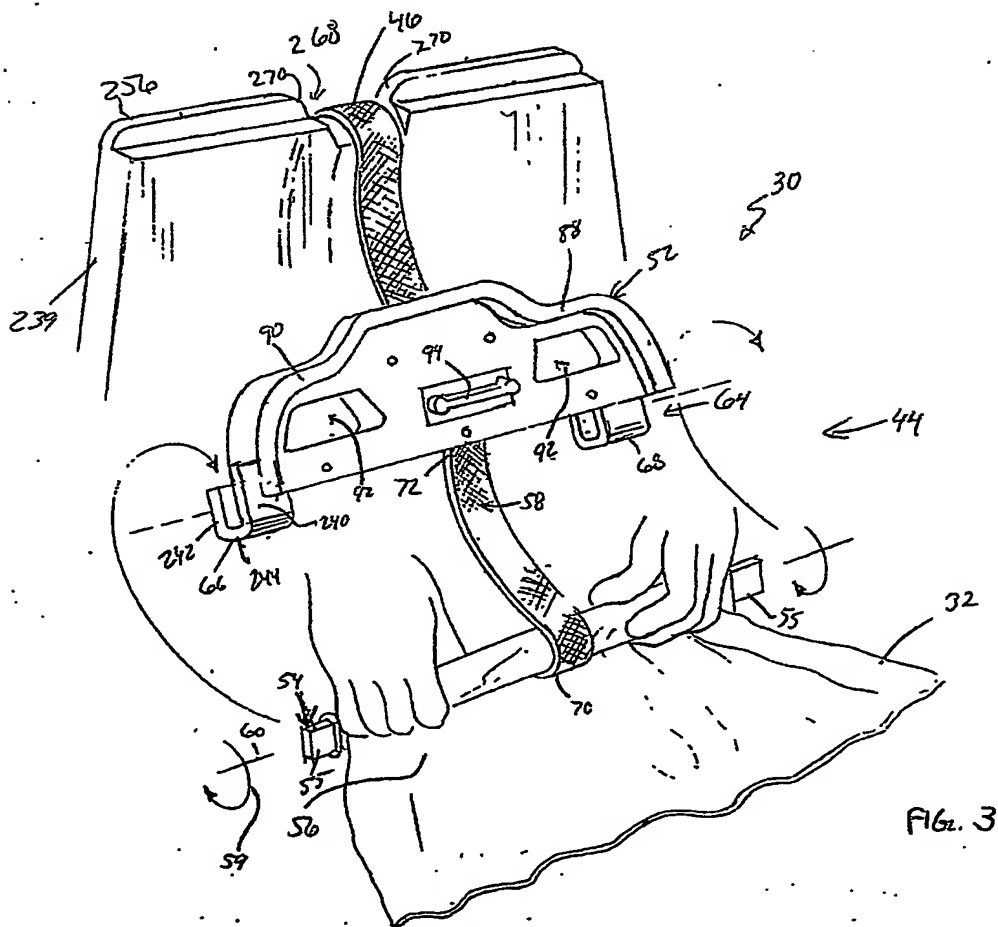
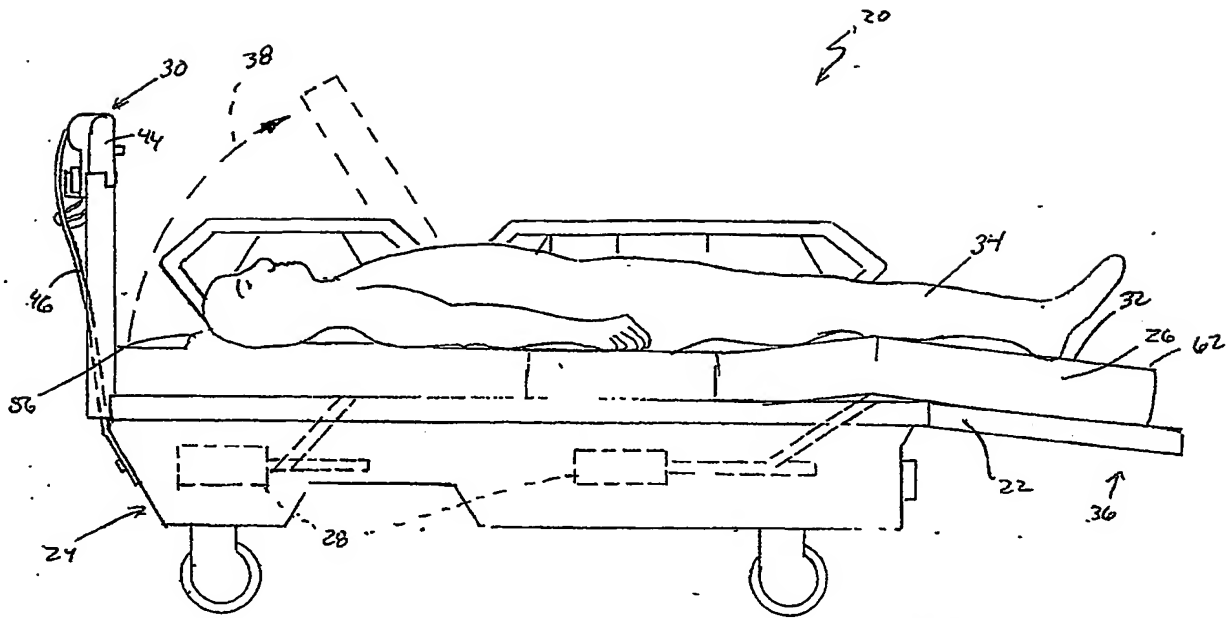
15 F8. The apparatus of claim F1, wherein the tensioning mechanism includes a spool around which the first belt is wound, the spool being biased in a first direction to maintain the first belt taut.

F9. The apparatus of claim F8, wherein the tensioning mechanism includes a ratchet to inhibit movement of the spool in a second direction but permit movement of the spool in the first direction.

20 F10. The apparatus of claim F9, wherein the ratchet includes a toothed wheel and a pawl movable between a tooth-engaging position and a released position, the pawl biased to the released position to permit movement of the spool in the second direction, the pawl being movable to the tooth-engaging position upon actuation of a handle coupled to the pawl to inhibit movement of the spool in the second direction when the handle is actuated.

25 G1. A method for orienting a patient in a hospital bed having a frame and a bed sheet on a mattress, the method comprising:  
providing a patient positioning apparatus including a sheet coupler,  
coupling the apparatus to the bed frame, coupling the sheet coupler to  
the sheet, moving the bed from a lowered position to a raised position so that a head  
30 end of the sheet is moved toward a head end of the mattress.

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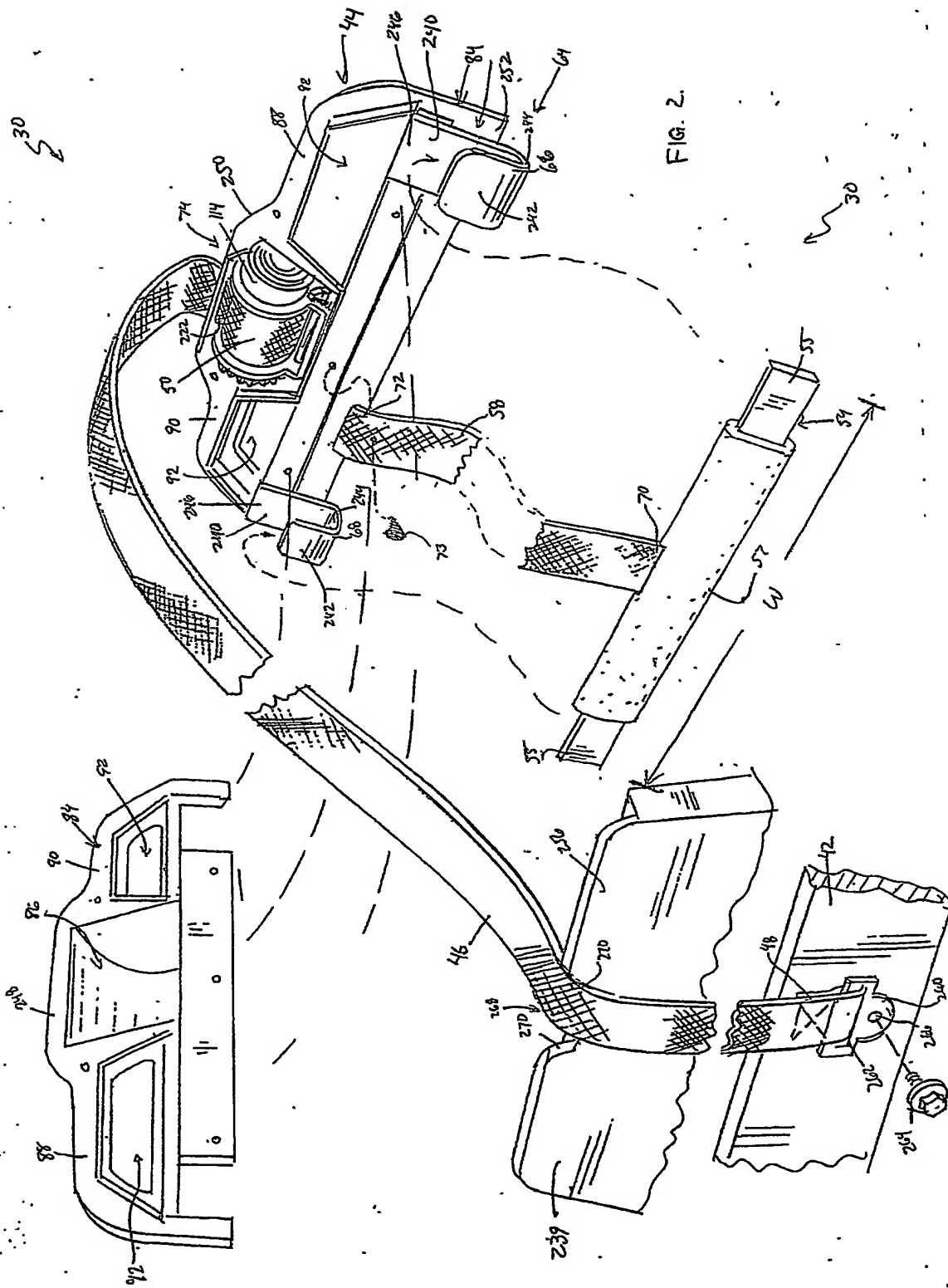
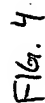


FIG. 2

KS





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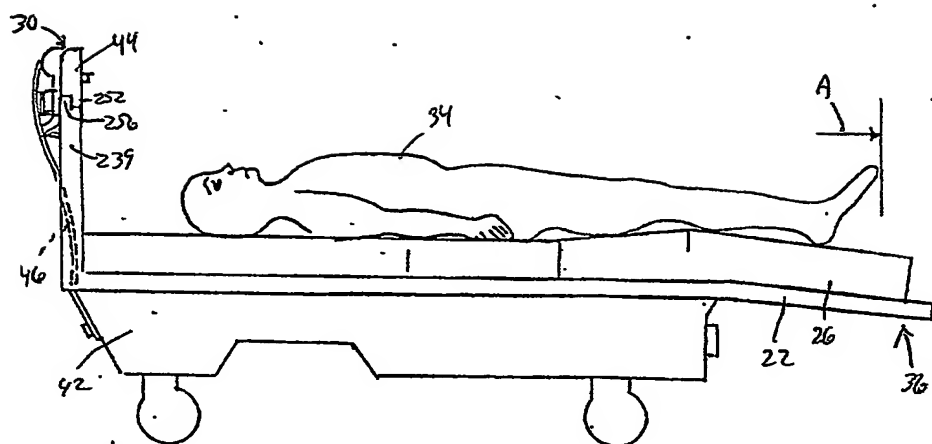


FIG. 7

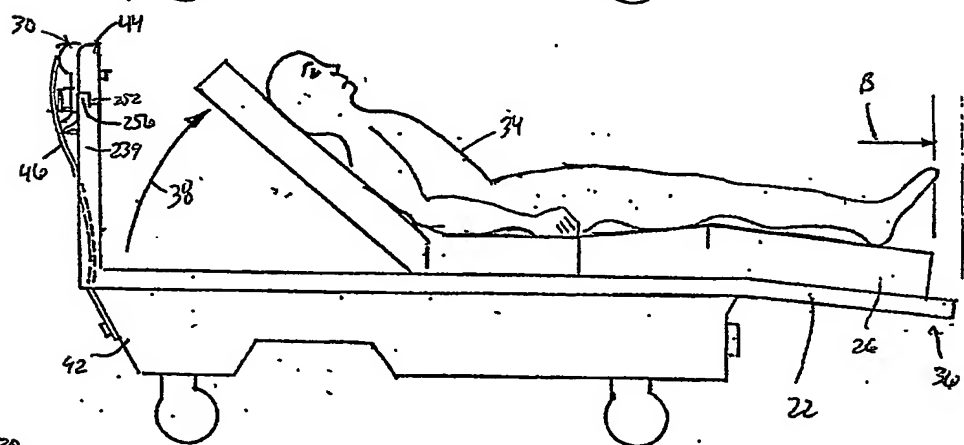


FIG. 8

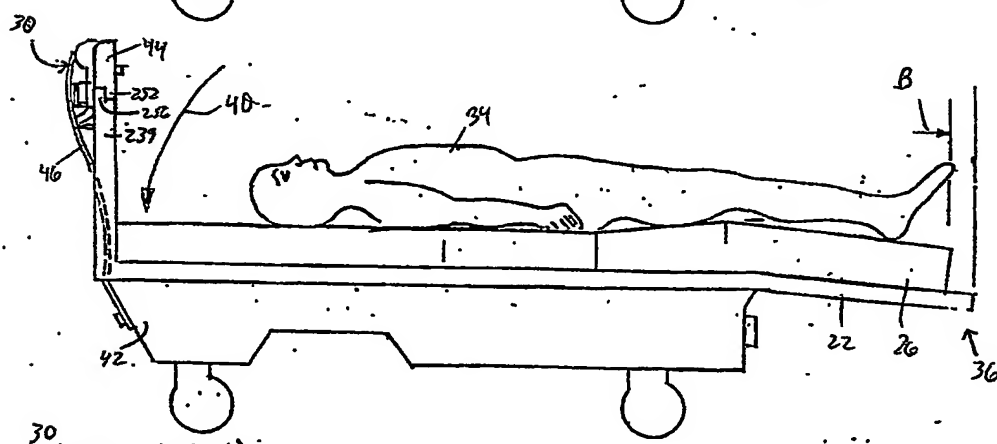


FIG. 9

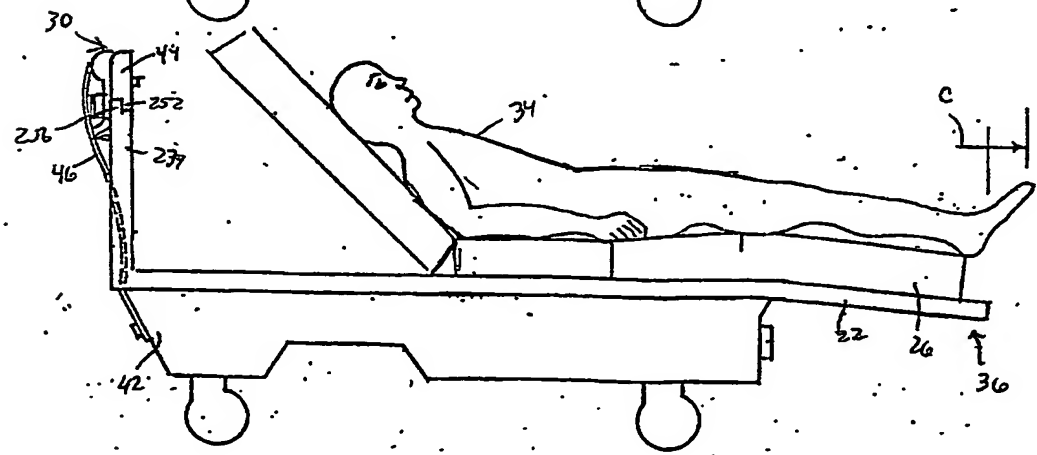
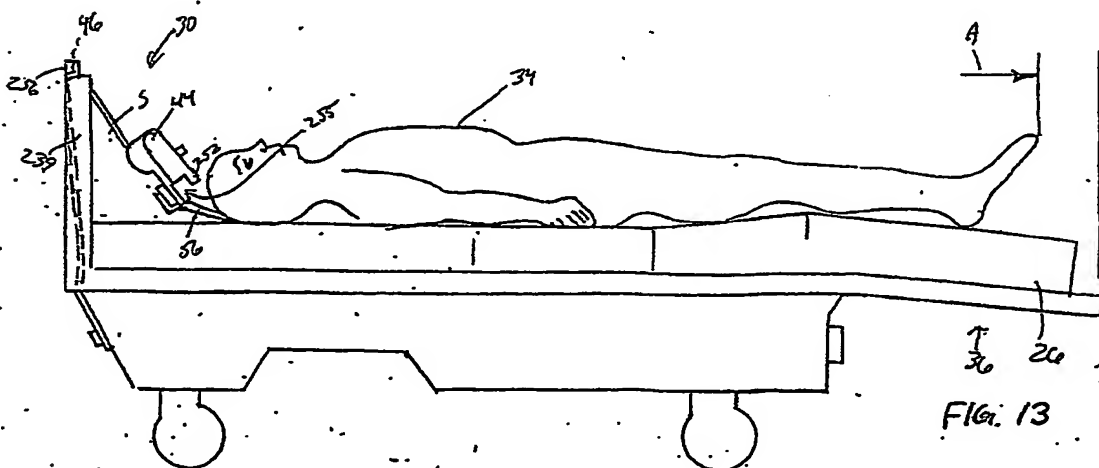
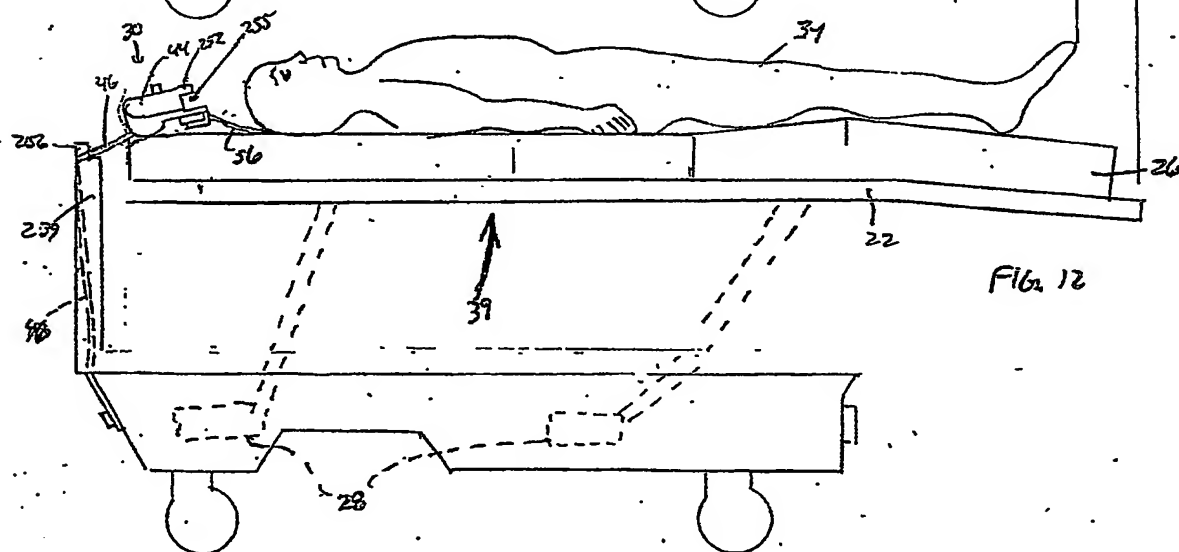
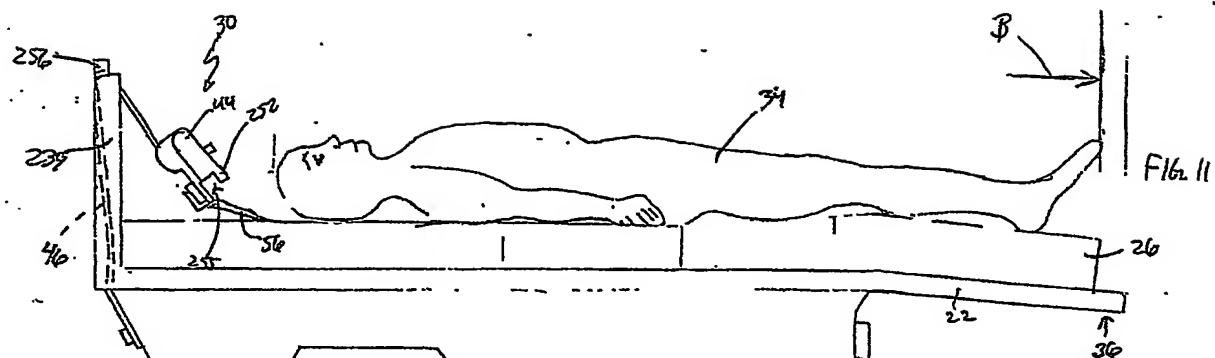


FIG. 10

THE UNIVERSITY OF CHICAGO



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